

Abstract of
Invited Discourse To Be Presented At
Annual Meeting of the Czech Astronomical Society
N. Copernicus Observatory & Masaryk University
Brno, The Czech Republic
September 2–5, 1999

Progress of Cometary Science in the Past 100 Years

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Enormous strides made by cometary science during the 20th century defy any meaningful comparison of its state 100 years ago and now. The great majority of the subfields enjoying much attention nowadays did not exist in the year 1900. Dramatic developments, especially in the past 30–50 years, have equally affected observational and theoretical studies of comets. The profound diversification of observing techniques has been documented by the ever widening limits on the electromagnetic spectrum covered. While the time around 1900 marked an early period of slow and painful experimentation with photographic methods in cometary studies, observations of comets from the x-ray region to the radio waves have by now become routine. Many of the new techniques, and all those involved with the wavelengths shorter than about 300 nm, were made possible by another major breakthrough of this century — observing from space. Experiments on dedicated Earth-orbiting satellites as well as several deep-space probes have provided fascinating new information on the nature and makeup of comets. In broader terms, much of the progress has been achieved thanks to fundamental discoveries and major advances in electronics, whose applications resulted in qualitatively new instruments (e.g. radiotelescopes) and sensors or detectors (e.g. CCD arrays). The most universal effect on the entire cometary science, from observing to data handling to quantitative interpretations, has been, as in any other branch of science, due to the introduction of electronic computers, with their processing capabilities not only unheard of, but literally unimaginable, in the age of classical desk calculators. As if all this should not be enough, the today's generations of comet scientists have, in addition, been blessed with nature's highly appreciated cooperation. Indeed, in the span of a dozen years, between 1985 and 1997, we were privileged to witness four remarkable cometary events: (i) a return of Halley's celebrated comet; (ii) the impact of an extensively fragmented comet Shoemaker-Levy 9 into Jupiter — a once-in-a-millennium episode; (iii) a closeup appearance of a small but very active Earth-approaching comet Hyakutake; and (iv) an unforgettable celestial show of comet Hale-Bopp, one of the brightest and the most massive comets ever observed. We have been — and for many years to come will be — harvesting scientifically lucrative findings based on the flood of data accumulated during observational campaigns organized for these and other recent objects. Our understanding of cometary phenomena will continue to grow as observing techniques are further being improved and as more sophisticated theories are being developed. Recent accomplishments achieved in the rapidly expanding field of comets are certain to stimulate the members of this astronomical community in their quest for new discoveries in the 21st century!